

SEP - 2 2003

K031739



## 510(k) Summary

This summary of the 510(k) safety and effectiveness information is being submitted in accordance with the requirements of SMDA 1900 and CFR 807.92.

The assigned 510(k) number is:

**Summary prepared on:** June 3, 2003

**Submitted by:**

i-STAT Corporation  
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**Contact:**

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**Establishment Registration Number:** 2245578

**Identification of Device:**

Device Name: Cardiac Troponin I (cTnI) Test  
Proprietary/Trade Name: i-STAT® cTnI Test  
Common Name: cardiac troponin I, cTnI  
Device Classification: II  
Regulation Number: CFR§ 862.1215  
Panel: Immunoassay Method, Troponin Subunit  
Product Code: MMI

**Identification of the Predicate Device:**

Device Name: Dade Behring Stratus® CS Cardiac Troponin I TestPak

**Intended Use of the Device:**

The i-STAT cTnI test is an *in vitro* diagnostic test for the quantitative measurement of cardiac troponin I in heparinized whole blood or plasma samples. Cardiac troponin I measurements can be used as an aid in the diagnosis and treatment of myocardial infarction and in the risk stratification of patients with acute coronary syndromes with respect to their relative risk of mortality.

The cartridge is to be used with the i-STAT 1 Analyzer, but not with the i-STAT Portable Clinical Analyzer or the Philips Medical Systems (formerly Agilent Technologies) Blood Analysis Module (BAM). As part of the i-STAT System, the cTnI test is to be used by trained health care professionals in accordance with a facility's policies and procedures.

**Description of the Device:**

The i-STAT cTnI test is contained in a single test cartridge. In use, the user scans a barcode and then places approximately 16 microliters of fresh whole blood in the cartridge. The cartridge is inserted into the thermally controlled i-STAT 1 Analyzer, and all analytical steps are performed automatically. Patient and user information may be entered into the analyzer via a keypad during the automated analysis cycle.

As the analyzer performs several quality checks and controls the temperature of the sensors via resistive heating to the underside of the sensor chips, the substrate/wash fluid is released into a conduit within the cartridge and a metered volume of the sample over the sensor chips. The enzyme-linked antibody conjugate dissolves into the sample and the sample incubates for a controlled time. The sample is then pushed into a waste chamber and the substrate/wash solution is brought over the sensors. The alkaline phosphatase captured on the cTnI sensor cleaves the substrate present in the substrate/wash fluid, giving rise to an amperometric signal which is measured.

The cTnI test cartridge is assembled from plastic components that provide the conduits for fluid handling and house the sensor chips. The test is identified to the user through the name and color code on the cartridge label and by the analyzer through features integral to the cartridge.

**Comparison to Technological Features of the Predicate Device:**

The following is a comparison of technological features of the i-STAT and Stratus CS Cardiac Troponin I methods:

Characteristic	Stratus CS	i-STAT System
<b>Assay methodology</b>	Two site ELISA	Two site ELISA
<b>Capture site</b>	Heterogeneous	Heterogeneous
<b>Capture antibodies</b>	Monoclonal	Monoclonal
<b>Enzyme label antibody</b>	Monoclonal	Polyclonal
<b>Enzyme label</b>	Alkaline phosphatase	Alkaline phosphatase
<b>Analysis sequence</b>	Sequential capture/label	Simultaneous capture/label
<b>Analysis time</b>	14 minutes	10 minutes
<b>Sample type</b>	Plasma	Whole blood or plasma
<b>Enzyme detection</b>	Fluorescent	Electrochemical

**Summary of Non-Clinical Performance in Support of Substantial Equivalence:**

- Studies established that the i-STAT cTnI test is insensitive to hematocrit levels from 0 to 65 %PCV.
- Studies established that isoforms of cTnI were detected to similar extents by the i-STAT and Stratus CS methods. When free cTnI, IC complex, ITC complex, dephosphorated, and phosphorated isoforms were tested, the relative responses for the two methods ranged from 83% to 122%.
- Studies established that the interference effects from common medications, particularly those commonly prescribed to patients with cardiovascular conditions, were similar to the effects for those drugs on the Stratus CS cardiac troponin I test.
- Studies established that the lower limit of detection (LLD) for the i-STAT method is a comparable 0.02 ng/mL versus 0.03ng/mL for the Stratus CS method.
- The imprecision of the i-STAT cTnI test using plasma controls was established using in-house and user studies. The Level 1 Control %CV was 7.8% at 0.53 ng/mL, the Level 2 Control %CV was 8.5% at 2.17 ng/mL, and the Level 3 Control %CV was 7.6% at 31.82 ng/mL. This includes within-lot, lot-to-lot, vial-to-vial, analyzer-to-analyzer, and operator-to-operator components of the imprecision.

**Summary of Clinical Test Performance is Support of Substantial Equivalence Claims:**

Studies conducted at three external clinical sites compared the results of the i-STAT cTnI test to those of the Dade Behring Stratus CS STAT Fluorometric Analyzer using the Stratus CS Cardiac Troponin I TestPak for samples from patients who presented to the hospital with acute, severe, and prolonged chest pain. Heparinized whole blood and plasma samples were analyzed on the i-STAT System while plasma samples were analyzed on the Stratus CS. The methods were compared using Deming regression analysis. The results are summarized in the table below:

Statistic	Definition	i-STAT whole blood vs Stratus CS plasma		i-STAT plasma vs i-STAT whole blood	
		all samples	samples where $[cTnI] < 3.0 \text{ ng/mL}$	all samples	samples where $[cTnI] < 3.0 \text{ ng/mL}$
N	The number of patient samples included in the data set	189	112	188	118
Mean	The average of the comparative method result over the sample population	4.79	0.738	4.27	0.712
Range	The range of comparative method results obtained over the sample population	0 - 46.27	0 to 2.90	0 to 37.9	0 to 2.95
Sxx	The pooled estimate of the within-sample standard deviation of the comparative method over the sample population	0.28	0.029	0.31	0.048
Syy	The pooled estimate of the within-sample standard deviation of the test method over the sample population	0.31	0.046	0.36	0.065
Slope	The Deming slope of the correlation	0.883	0.880	0.948	1.002
Intercept	The Deming intercept of the correlation	0.029	-0.036	0.052	-0.010
Correlation	The correlation coefficient determined from regression	0.975	0.975	0.997	0.991
Sy.x	The standard error of the estimate of the regression of the regression of y (test method) on x (comparative method) calculated using the regular regression slope	1.40	0.15	0.55	0.097

**Conclusions:**

Based on clinical and non-clinical data the i-STAT cardiac troponin I test is insensitive to hematocrit level from 0 – 65 %PCV, detects isoforms of cTnI in a similar manner as the Stratus CS cardiac troponin I test, shows similar interference effects to common drugs as the Stratus CS cardiac troponin I test, and has a lower limit of detection (LLD) of 0.02 ng/mL. Studies using plasma controls indicate adequate imprecision for low, mid-range, and high results. Clinical data indicates acceptable correlation to the predicate device.



DEPARTMENT OF HEALTH & HUMAN SERVICES

Food and Drug Administration  
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SEP - 2 2003

Gregory Shipp, M.D.  
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i-STAT Corporation  
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Re: k031739  
Trade/Device Name: i-STAT® cTnI Test  
Regulation Number: 21 CFR § 862.1215  
Regulation Name: Immunoassay Method, Troponin Subunit  
Regulatory Class: II  
Product Code: MMI  
Dated: June 3, 2003  
Received: June 4, 2003

Dear Dr. Shipp:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to such additional controls. Existing major regulations affecting your device can be found in Title 21, Code of Federal Regulations (CFR), Parts 800 to 895. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Parts 801 and 809); and good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820). This letter will allow you to begin marketing your device as described in your Section 510(k) premarket notification. The FDA finding of substantial equivalence of your device to a legally marketed predicate device results in a classification for your device and thus, permits your device to proceed to the market.

Page 2 -

If you desire specific information about the application of labeling requirements to your device, or questions on the promotion and advertising of your device, please contact the Office of In Vitro Diagnostic Device Evaluation and Safety at (301) 594-3084. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR Part 807.97). You may obtain other general information on your responsibilities under the Act from the Division of Small Manufacturers, International and Consumer Assistance at its toll-free number (800) 638-2041 or (301) 443-6597 or at its Internet address <http://www.fda.gov/cdrh/dsma/dsmamain.html>.

Sincerely yours,

*Steven Gutman*

Steven I. Gutman, M.D., M.B.A.  
Director  
Office of In Vitro Diagnostic Device Evaluation and Safety  
Center for Devices and Radiological Health

Enclosure

### 3 Indications for use

510(k) Number (if known): K031739

Device Name: i-STAT Cardiac Troponin I test

The i-STAT Cardiac Troponin I (cTnI) test is an *in vitro* diagnostic test for the quantitative measurement of cardiac troponin I in heparinized whole blood or plasma. Measurements of cardiac troponin I are used in the diagnosis and treatment of myocardial infarction and as an aid in the risk stratification of patients with acute coronary syndromes with respect to their relative risk of mortality.

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of Device Evaluation (ODE)  
(Per 21 CFR 801.109)

  
Division Sign-Off

Office of In Vitro Diagnostic Device  
Evaluation and Safety

510(k) K031739

  
prescription

over-the-counter